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L29: Entry 48 of 83

File: USPT

Sep 1, 1998

DOCUMENT-IDENTIFIER: US 5800625 A

TITLE: Removal of material by radiation applied at an oblique angle

Brief Summary Text (9):

As described in detail in the '258 and '431 applications, many techniques have been proposed (and are currently used) for removing undesired materials. These include wet chemical cleaning (RCA process), dilute HF, megasonic and ultrasonic, and supercritical fluid cleaning, UV and ozone cleaning, brush cleaning, vapor HF, laser-assisted liquid cleaning (including the Allen process and Tam process), surface melt, annealing, ablation, plasma cleaning and dry ice (CO.sub.2) cleaning.

Detailed Description Text (13):

In summary, to remove a given thickness of undesired material from a substrate treatment surface, a minimum total energy flux (a total number of photons of a given energy level per unit area) must be applied to the undesired material. If multi-photon bonds are involved, a certain power flux is also required, and the higher the power flux, the greater the chance that each bond site will be subjected to the requisite photon arrival rate. The selection of a suitable source of energetic photons thus requires an evaluation of the required photon energy and, for multi-photon bonds, the available power. As will become apparent from the data presented below, to remove CMP residue and particles, preferred photon sources are therefore pulsed UV lasers, which have the highest peak power levels and high photon energies.

Detailed Description Text (39):

In this example, silicon nitride particles in an aqueous suspension were deposited on bare silicon and allowed to dry. This presented a strongly adhered and very dense contaminant (greater than 10,000 particles on a 150 mm wafer). The flowing gas in this example was argon for Run 1 and nitrogen for Runs 2-17. The gas was delivered at approximately 44 l/min. The quantity of contaminant on the substrate before and after treatment was measured by a Particle Measurements Systems (PMS) silicon wafer particle counter Model 3600 XP. This particle counter employs two HeNe lasers: one operating in p-polarization and the other in s-polarization with its incident beam at angle of 30.degree. to the wafer plane. The collection optics for the particle counter are arranged normal to the wafer plane. Thus, the number of contaminant particles on the substrate in a number of size ranges can be compared before and after treatment.

Current US Original Classification (1):134/1

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Current US Cross Reference Classification (1):  
134/1.2

h e b b g e e e f c e c